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WHITE RIVER SHALE OIL CORPORATION

RESPONSE TO

DIVISION OF OIL GAS AND MINING

JULY 21, 1982 REQUEST FOR ADDITIONAL INFORMATION

White River Shale Oil Corporation
July 30, 1982

7. QUESTION

Panel outlines on the submitted mylar overlay are unclear. They should either be discussed or indicated on the mylar in order to clarify the Division's understanding. Also, no yearly sequential estimates were indicated on the submittal. Estimates such as "... and data will be transmitted to UDOGM as soon as they are available" are not satisfactory. (If information cannot be submitted prior to approval of the application, a specific date of information completion should be committed to beforehand.)

RESPONSE

WRSOC is preparing another mylar overlay that will more clearly present:

a. Panel outlines.
b. Yearly sequential estimates.
c. Layout of all panels to be mined during Phase I.

This mylar overlay will be submitted to DOGM no later than August 16, 1982.

9. QUESTION

Will any regrading occur subsequent to mining which will be intended to achieve an approximate premining contour? This concern is yet to be addressed and is also mentioned in Item 20.

RESPONSE

The original version of Question 9 did not address regrading subsequent to mining which will achieve an approximate premining contour, therefore WRSOC's original response did not address it. The primary objective of regrading will not be to achieve an approximate pre-mining contour. The primary objectives of regrading will be to mitigate erosion and sedimentation, make the project site safe for wildlife and humans, and restore wildlife habitats. Regrading will achieve an approximate premining contour, however, in drainages where road fill will be re-contoured to avoid obstruction of the drainage.

10. QUESTION

In what direction will terraces as such be sloped? It is indicated that terraces will be flat. How does this fit in with the "water-harvesting" approach. In approved cases in the past, terraces have been slightly sloped to the inside. Is there a reason WRSOC prefers not to do this? Please clarify.

10. RESPONSE

Figure 2-2 of the Mining Permit application is the correct representation of the current concept of final surface preparation for the processed shale pile. On sloped surfaces, water collecting surfaces will alternate with soil trenches and a terrace to assist in water harvesting (McKell, Van Epps, and Richardson, 1979)*. The terrace is relatively flat when compared to the 4:1 slope of the collecting surfaces, but will actually be sloped toward the soil trench. Since the soil trenches are in the center of the terraces, the terraces will be sloped to the inside and the outside. WRSOC does intend to use this water-harvesting approach, with the understanding that final design must await information on the physical properties of processed shale.

11. QUESTION

No estimated material balance has been provided. WRSOC states that "a grading plan has been developed." Why was it not included? It is the policy of the Division to strongly discourage expansion of the disturbed area for borrow unless as a last resort.

RESPONSE

WRSOC's statement, "a grading plan has been developed" referred to the plan to balance cut and fill, not actual grading plans (drawings). Grading plans (drawings) had not been completed when the original responses were submitted. Some have been completed at this time. However, complete grading plans for the project include over 100 drawings. We have submitted representative grading plans that should meet DOGM requirements. If you wish to receive additional grading plans, please specify the areas you are concerned with and we will provide you with the appropriate grading plans.

WRSOC agrees with the DOGM policy to expand the disturbed area for borrow only as a last resort. As described in our original response, the priorities for borrow locations are:

1. Other areas that were going to be disturbed at a later date anyway.
2 Nearby on-tract areas that were not going to be disturbed.
3. Nearby off-tract areas that were not going to be disturbed.

*McKell, C.M., G. Van Epps, and S. G. Richardson, 1979. Final Report, Revegetation Studies of Disturbed Areas and Processed Shale Disposal Sites. Utah State University Institute for Land Rehab., Sub. to WRSP.

11. RESPONSE (Continued)

The entire Phase I grading plan is expected to be balanced between cut and fill. However, the overall balance will not be completed until January 1988. Cut and fill data for the three increments of Phase I, which may not always reflect a balance of material, will be submitted to DOGM as follows:

- Estimated cut and fill data for the first increment of Phase I (i.e., 110 acres) will be submitted by October 15, 1982.
- Estimated cut and fill data for the second increment of Phase I (i.e., process facility area) will be submitted by December 1985.
- Estimated cut and fill data for the third increment of Phase I (i.e., processed shale disposal area) will be submitted by December 1987.

Enclosed as Attachment A, is estimated cut and fill data for the interim approval area. As stated above, the remainder of the first increment cut and fill data will be submitted by October 15, 1982.

12. QUESTION

Any wildlife mitigation plan prepared should be submitted to DOGM as well as the Oil Shale Office. A written commitment to this effect should be made.

In accordance with the quote in Question 13 "restore the vegetation... which will support fauna of the same kinds and numbers ..." Any riparian habitats which are disturbed should be reclaimed as riparian habitats due to their importance to wildlife. Obviously, areas inundated by the dam would not apply. However, the company could help speed the emergence of riparian vegetation along the edges of the reservoir through some seeding and/or transplanting efforts. This would be a good mitigation technique.

RESPONSE

Any wildlife mitigation plan submitted to the Oil Shale Office will also be submitted to DOGM. Concerning speeding emergencE of riparian vegetation along the edges of the White River reservoir through seeding and/or transplanting, WRSOC has no plans to do so at this time because WRSOC is not involved in construction of the dam or reservoir. The only riparian area disturbed by WRSOC will be the 1.5 acres described for the water wells in our original response. This area will be inundated by the reservoir and, therefore, should not require restoration.

14. QUESTION

If and when subsidence occurs due to the mining technique employed, collected data results and mitigation plans (if warranted) should be submitted to the Division for approval.

RESPONSE

Should surface subsidence occur on the tracts, data will be available through the monitoring program described in Section 7.4 of the Environmental Monitoring Manual. In such a situation, both the data and any necessary mitigation plans will be submitted to the Division.

15. QUESTION

In the response "prior to construction of the solid waste landfill, trash and refuse material will be transported off the Tracts to a state approved solid wate landfill, probably in Vernal." It should be added that appropriate agreements be made for dumping there. DOGM requests copies.

RESPONSE

The City of Vernal, Department of Public Works has been notified of the quantities of solid waste (approximately 8 tons/month) that would be incoming to the Vernal landfill prior to use of the WRSP tract landfill. The agency has verified that it can accept this quantity of solid waste. Furthermore, no written agreement is necessary between the Department of Public Works and the disposal contractor. Confirmation of this information from the City is enclosed as attachment G.

16. QUESTION

The Division must assume a need for reclamation of raw shale fines on-site for bonding purposes. Assuming Phases II and III do not occur, how will this material be addressed?

RESPONSE

WRSOC interpreted this question to be asking for the fate of the fine shale assuming continuation of this project through Phases II and III, not assuming abandonment after Phase I. Question 16 did not address abandonment after Phase I. Our response to this situation is as follows:

WRSOC agrees that the bond will include raw shale fines reclamation at the appropriate time. As previously discussed with DOGM, the bond for Phase I will be divided into three increments. The first increment covers activities

16. RESPONSE (Continued)

through 1985. No raw shale fines will be produced until after 1985. A reclamation plan for raw shale fines will be developed for bonding purposes and submitted to DOGM by December 1985. The bond will be posted prior to development of the fines site.

If Phases II and III do not occur, detailed abandonment plans for Phase I will be prepared. These plans will include proper reclamation of the raw shale piles. In general, the pile would be graded to approximate natural contours of the surrounding topography, covered with topsoil, and revegetated. Any such plan will be provided to DOGM when it is prepared, which will be by December 1991, if abandonment occurs at the end of Phase I.

17. QUESTION

The value for the pillar size is based on "available geotechnical data" which indicates the rock in these pillars is competent. The data are requested as well as the source.

RESPONSE

ATTACHMENTS B AND C CONTAIN CONFIDENTIAL INFORMATION

The Shaft core logs (Cores DP and DS) in the original Mining Permit application as well as the attached core logs (Attachment B) for the P and X-numbered holes around the shaft and decline area were used to evaluate the competency of the ceiling rock for use as pillars. From this evaluation as well as rock mechanics studies (Attachment C) that were performed on the X-numbered holes, a nominal 60 foot by 75 foot configuration for the pillars was selected. Pillars that encase existing gas wells will be enlarged to 100 feet square to account for any aberrant orientation of the gas wells and to add an additional safety factor. It should be noted that design of the pillars will be reassessed after the first panel is mined to determine any potential problems.

18. QUESTION

It is suggested that ripped road pavement be placed underground or in shafts or inclines prior to final surface regrading. The Division does not concur with the current project plans to dispose of this material "in or adjacent to the roadbed." An alternative commitment to this should be made by the applicant.

18. RESPONSE

WRSOC will consider the disposal of ripped road pavement underground or in the shafts or decline prior to final surface regrading during abandonment. This commitment is contigent upon a detailed evaluation of selective costs for disposal and mitigation and receiving approval from the Oil Shale Office and the BLM.

19. QUESTION

The question is not addresed, "how deeply" the concrete foundation will be buried. DOGM needs to evaluate a Phase I abandonment plan. Again, this is necessary in bond computation.

RESPONSE

A topsoil covering of 18 inches (to bury the broken up concrete foundations, pads, etc.) should be used to compute the bond. This value has been selected based on data obtained by Dr. Cy McKell from revegetation test plots located on the Tracts. Successful revegetation was accomplished on these plots with minimum topsoil thickness (no greater than 18 inches) on top of fractured bedrock material. Since the broken up concrete approximates the nature of fractured bedrock, successful revegetation is expected on top of the concrete foundations, pads, etc., with a minimum topsoil covering of 18 inches.

Detailed abandonment plans for any phase of the WRSP will be prepared when abandonment becomes necessary. If a Phase I abandonment plan is necessary, it will be provided to DOGM when it is prepared.

20. QUESTION

The DOGM requests the grading maps to look at the spent shale disposal areas and cross-sections as well as expected postmining contours. Did not address dam cross sections. Again, bond cannot be finalized without this information. Detailed plans have already been requested.

RESPONSE

The disposal area for the processed shale will not be graded prior to disposal since the topography of the area represents a natural containment basin, and no alteration is necessary. The only work prior to disposal of the processed shale will be grubbing and topsoil removal operations.

The graded configuration including expected postmining contours of the processed shale pile itself cannot be

20. RESPONSE (Continued)

determined until retorted shale is available and subsequently analyzed at the experimental processed shale area (see Section 7.3 of Environmental Monitoring Manual). Completion of this analysis and the grading plan for the pile is expected by March 1989. A grading Map and post-mining contour map will be submitted to ODOGM at that time.

A cross-section drawing of the Phase I process area runoff and leachate retention dam is not available, pending completion of a geotechnical survey of the dam area. The survey and subsequent design of the dam is expected to occur by June 1987. A detailed cross-section of the runoff and leachate dam will be submitted to DOGM by December 1987.

21. QUESTION

WRSOC should submit stability data on the spent shale material prior to or with the proposal to eliminate the embankments.

RESPONSE

Although it is intended that rock embankments will be constructed as structural support for the processed shale pile, experimental tests of WRSP retorted shale may indicate the embankments will not be necessary. Should this occur, complete stability test data of such parameters as wind and water erosion factors, compaction values, internal pile moisture and triaxial shear will be submitted to DOGM. The decision point for the embankments is expected by March 1989, and data submittal to DOGM is also expected by March 1989.

23. QUESTION

Toxicity is intended to address not only acidity and alkalinity but also salinity and possible trace element problems. If information is available regarding these concerns, please provide it to DOGM. If not, a program aimed at adequately sampling and testing various materials brought to the surface shall be developed.

RESPONSE

The only expected sources of salts or trace elements during shaft and decline construction would be from Birds' Nest aquifer water or waste rock. Analysis of the Birds' Nest water was presented in the original mining permit application as Table 1-2. Trace element analysis of rock overlying the mining zone is presented in Attachment D. The analyzed sample comes from core hole X-13 (see Figure 1-4, Sheet 1 in the Mining Permit for location) which is in the shaft/decline area.

23. RESPONSE (Continued)

Both Birds' Nest water and runoff from the waste rock piles will be isolated from the environment within the runoff retention pond to the north of the mine area. Therefore, any potential toxic effects would be contained and controlled on Tract. Water quality analyses of the run-off water in the pond will be conducted periodically to assure that potential pollutants in the pond do not reach deleterious levels precluding reuse.

Because of the data already available (referenced above) and runoff isolation from the environment in the runoff retention pond, a materials sampling and testing program is not contemplated.

25. QUESTION

Please answer the question to the best of your knowledge. Bond costs have been computed by the applicant. In the absence of this information, the Division cannot appraise these costs relevant to bonding.

RESPONSE

No specific designs have been developed for the permanent closure of the portals, shafts and declines. However, for purposes of the abandonment cost estimate, a preliminary plan for sealing the portals and shafts includes a 10 foot thick concrete plug reinforced with 80 pounds of steel for each cubic yard of concrete. More specific details of these plugs will be included in the abandonment plan, at least 25 years hence assuming full Phase III operation, or in December 1991 assuming abandonment after Phase I.

27. QUESTION

DOGM still requires a specific numerical standard for revegetation prior to initiation of mining. Since four habitat types, with varying percentages of natural vegetative cover, will be disturbed, the standard for general disturbed areas maybe an average figure.

Specific vegetation techniques and standards for the waste rock pile may be submitted at a later date as indicated in the answer to Question 30. A commitment to provide DOGM with any annual reports or publictions that are developed from such studies as part of the Annual Operations and Progress Report is needed.

RESPONSE

In the attached monitoring plan for revegetated areas (Attachment E) it is proposed that the standard for revegetation success utilize the averages of the three dominant

27. RESPONSE (Continued)

habitat types (sagebrush-greasewood, shadscale, and juniper) where the majority of construction related disturbance will occur. The riparian habitat type is specifically omitted from the average, as explained in the plan.

The numerical standard for successful revegetation shall be that the disturbed areas achieve at least 70% of the total cover of the baseline data on reference areas within a period of three years. The specific values will be derived from the Final Environment Baseline Report (VTN, Inc.) and subsequent WRSP Annual Reports. Since there is a substantial quantity of data to review, these values will be provided to DOGM by August 16, 1982.

Specific revegetation techniques and standards for the processed shale pile and any special studies or reports will be submitted to DOGM by December 1991 (experimental shale pile studies will commence by September 1989). Annual progress reports for WRSP will also be submitted to DOGM as they are prepared. Question 30 does not refer to the waste rock pile, but it refers to the processed shale pile. The waste rock pile will be revegetated as any other fill area described in Section 2 of the Mining Permit.

28. QUESTION

There is a disagreement here as to when monitoring will be conducted (semi-annually or quarterly). Also the monitoring manual does not seem to discuss revegetation monitoring specifically. Will a separate plan for monitoring revegetated areas need to be developed for the Oil Shale Office? If so, DOGM would like a copy. If not, DOGM needs a specific monitoring plan detailing specific methods that will be used to monitor revegetation, and a specific discussion of statistical comparisons to be made between revegetated areas and natural vegetation communities. This should be submitted prior to final permit approval.

RESPONSE

The monitoring plan for revegetated areas is enclosed as Attachment E. It is anticipated that the monitoring program for reclaimed process shale areas will be similar to the monitoring program discribed for revegetated disturbed areas. A specific monitoring plan for process shale areas will be prepared and submitted to DOGM by March 1988. This plan will be based upon data obtained from the Revegetation/Reclamation Studies and the Processed Shale Experimental plot as described in Appendix B and Appendix D, respectively, in the Phase I Mining Permit Application.

29. QUESTION

Assuming the forthcoming response to #27 is adequate, this will no longer be of concern.

RESPONSE

See Question 27.

30. QUESTION

The response is adequate provided updates are made available to the Division in the Annual Operations and Progress Report.

RESPONSE

WRSOC will provide updates as requested to DOGM in the Annual Operations and Progress Report.

31. QUESTION

The response is adequate provided updates are made available to the Division in the Annual Operations and Progress Report.

RESPONSE

WRSOC will provide updates as requested to DOIGM in the Annual Operations and Progress Report.

32. QUESTION

Specific plans for use of species in the reclamation species mix (i.e., planting rate, locations, treatments) should be submitted to DOGM prior to final permit approval.

RESPONSE

Question 32 was briefly answered in our original response. However, we have included the following discussion to clarify the plans for and use of the "reclamation species mix":

The reclamation species mix listed in Table 2-3 of the Mining Permit application is not intended for use in the overall revegetation of disturbed areas during or after construction or at the time of abandonment. This group of plants was developed for the sole purpose of enhancing, through the use of native species, those areas of the White River Shale Project frequented or inhabited by people. Some of the species are included in other groups that will be used in general revegetation due to their value as

32. RESPONSE (Continued)

wild-life forage, soil stabilizers, and so on. However, the species listed in Table 2-3 were chosen to provide a broad range of flowering periods and different types of plants (trees, shrubs, groundcover) in order to permit an aesthetically pleasing selection of plants to be made for use in areas where people live and work.

It is anticipated that species selected from this list will be used in the following areas: Bachelor camp; RV camp; plant administration and personnel support buildings; and all recreation areas. In most cases, container plants will be used in order to rapidly produce a pleasant environment near inhabited facilities. Availability of particular species as container plants will influence final selection; some species may be planted as seeds if container-grown plants are not available.

It must be emphasized that final selection and location of individual plants cannot be made until design of the facilities are complete. Design of the Module 1 Bachelor Camp will be complete by October 1, 1982. The existing RV camp is an interim facility (49 pads) for the exclusive use of one Subcontractor. Eventual expansion of the RV camp is anticipated, but probably not until construction of surface facilities commences in early 1986. Design of the expanded RV camp will probably begin in mid-1985. Design of plant administration and other personnel support buildings will not commence until 1985, along with design of other process facilities. The data produced at that time will be provided to DOGM. All recreational areas are associated with the camps. A landscape architect will select species to achieve various effects. For example, the periphery of the plant administration building may be treated with a variety of shrub and ground cover species selected from Table 2-3 to compliment the building, parking area, and pedestrian routes. At the camps, particularly in trailer sections, large shrubs and trees may be used to provide inhabitants with a sense of privacy and to avoid creating an impression of a stark and regimented environment. Travel between various facilities within the camps will be primarily pedestrian; shrubs and trees will be used to alleviate the harshness of gravel/concrete walkways, gravel pads and drive-ways, and paved roads.

Large expanses of disturbed land will not be treated with this particular species mix. All treatments utilizing this species mix will be local with respect to a particular facility, and will be designed to achieve a specific effect. The application rate for species planted as seeds will be 15 lbs. PLS/acre. The rate for container plants cannot be determined at this time because facility design is not complete. However, the actual rate for container

32. RESPONSE (Continued)

plants has no meaning in the context of the use of these plants. The number of individual plants required will be determined by the desired effect in particular situations.

33. QUESTION

Is the seed rate for Pure Live Seed? What is the biological basis for the planting of transplants during the fall as opposed to spring?

33. RESPONSE

The seed rates referred to in the Mining Permit are for pure live seed (PLS). All areas which will be permanently revegetated will be treated with both seeds and container-grown transplants, rather than a single method, in order to increase the probability of a successful revegetation effort. It is necessary that both treatments be applied nearly simultaneously, with drill or broadcast seeding preceeding transplanting. Drill seeding equipment would damage new transplants.

The preferred season for transplanting container-grown shrubs is in the spring (Van Epps and McKell, 1980).* However, fall is the better time for seeding so that seeds are allowed to overwinter and then make use of accumulated soil moisture to germinate in the spring. Survival of transplants planted in the fall is less than of those planted in the spring (ibid.), but the difference is not great enough to jeopardize a successful revegetation effort, particularly since WRSP will be planting 1750 plants per acres. Fall planting will also allow the seedlings to take advantage of winter and spring rains during the critical first few months after planting.

A decision to seed and transplant container plants in the spring would entail consideration of the additional cost of providing artificial "overwintering" for the seeds. Moisture, temperature changes and scarification are among the factors determining the germination rate. Seeds planted in the spring and not subjected to these factors prior to planting would have a very low initial germination rate. Most of the seeds probably would not germinate until after the next winter.

*Van Epps, G. A. and C.M. McKell, 1980. Revegetation of Disturbed Sites in the Salt Desert Range of the Intermountain West. Utah Agricultural Experiment Station, Land Rehabilitation Series Number 5. 22p.

34. QUESTION

In the general comments about reclamation activities, sealing of the shafts is not mentioned. This should be included.

RESPONSE

WRSOC agrees to seal the shafts as a part of reclamation activities during abandonment, provided that the Oil Shale Office approves of this action.

35. QUESTION

Same as Question 28.

RESPONSE

See Question 28.

36. QUESTION

The decommissioning plan which includes details on the run-off retention pond, the shale fines leachate collection pond and the spent shale runoff and leachate collection pond will not be addressed until it is prepared for the Oil Shale Office. At that time, variances will be requested. This is only acceptable to DOGM if the Board of Oil, Gas and Mining accepts it.

RESPONSE

WRSOC understands that the Board of Oil, Gas and Mining will need to accept our timing of the decommissioning plan and request for variances as described in order to meet DOGM approval.

37. QUESTION

No approval for work in these areas can be issued prior to the completion of adequate maps and plans.

RESPONSE

Soil isopach maps for the mine access road, water well service road, and bachelor camp were not available when our responses were originally submitted to DOGM. Four isopach maps are now available that cover the above mentioned areas plus the solid waste disposal site. They are presented herein as Attachment F.

38. QUESTION

It is not possible to judge the validity of the applicant's claim that nine inches of soil is available for the entire 100 acre disturbance from the information provided.

The depth of topsoil should be evaluated according to each specific area on the color-coded map E-04-E-1, submitted June 8, 1982. What were the figures in the June 8, letter referring to--which areas are included in the 39 acres? Please delineate. A breakdown of soil disturbance, its relationship to soil type depth, volume retrievable as compared to volume necessary to reclaim each area has not yet been provided.

The applicant has not answered the question regarding the relationship of surveyed areas to future spent shale disposal areas.

It may be possible to address the bulk of the processed shale site in the manner proposed. The applicant has not answered the quetion regarding approximate soil depth and volume associated with the reclamation of the processed shale ore terraces.

45,000 cu. yds. not feet.

RESPONSE

Although our June 8, 1982 letter to DOGM included an analysis of recoverable topsoil from a portion of the first increment of Phase I, we have not yet completed the analysis for the entire 110 acres of disturbance. However, we have surveyed the remaining areas which will be affected during the first increment of Phase I and topsoil isopach maps for these areas are enclosed as Attachment F (i.e., maps for the mine access road, the production water well road, the solid waste landfill area, and the entire Module 1 Bachelor Camp area). An analysis of the topsoil availability for these disturbed areas has not yet been completed, but will be submitted to DOGM by August 16, 1982. At that time we will have determined the topsoil availability associated with the entire 110 acres that will be disturbed through 1985. Once the additional topsoil analyses are complete (i.e., by August 16, 1982) WRSOC will be able to more accurately predict the topsoil depth available for reclamation for the first 110 acres of disturbance.

The topsoil isopach maps, when overlayed onto the Phase I site plan, provide a breakdown of soil disturbance and the depth and type of topsoil available at each location. From this information, topsoil volumes may be calculated. As

38. RESPONSE (Continued)

indicated above, this information will be provided by August 16, 1982 for the entire 110 acres associated with the first increment of Phase I. WRSOC does not propose to analyze the volume of topsoil necessary to reclaim each area compared to the volume retrievable at each area. Rather WRSOC will remove and store topsoil from disturbed areas.

We note that various acreage quantities have been referred to during conversations and in submittals to the DOGM. As designs and grading plans have been refined, the number of acres which will be distured has necessarily changed. For clarity, the following acreages represent the current status for Phase I:

	Pre-1985	Post-1985
Mining Area (Encompasses service and air intake shafts; decline portal; decline exhaust shaft; waste rock areas; mine service building; raw shale stockpile; change house; water treatment plant; topsoil stockpile; substation; sewage treatment plant; temporary lube and fuel storage; and the road interconnecting shafts, building and portal and temporary explosives magazine area.)	44 acres	0 acres
Lube and Fuel Storage	0 acres	5 acres
Water Well Access Road (Encompasses road, truck loading station and well pads.)	8 acres	0 acres
Runoff Retention Pond (Encompasses dam, temporary dam construction and laydown area, and pond.)	21 acres	0 acres
Explosive Magazine (Encompasses access road and magazine area.)	0 acres	3 acres
Mine Access Road (Encompasses road from tract access road to mine area. Includes temporary and permanent roads.)	10 acres	4 acres

(continued on next page)

38. RESPONSE (Continued)

	Pre-1985	Post-1985
Exhaust Shaft (Encompasses access road and shaft area.)	0 acres	8 acres
Bachelor Camp and RV Camp	20 acres	100 acres
Phase I Spent Shale Area (Encompasses Phase I spent shale dam and pond, experimental pile, and main pile.)	0 acres	325 acres
Shale Fines Area	0 acres	20 acres
Solid Waste Disposal Site and Road	7 acres	0 acres
Processing Area	0 acres	60 acres
TOTAL	110 acres	525 acres

The Phase I spent shale area is located in a different watershed adjacent to the mine area watershed . As noted in our original response, this area has not been surveyed for topsoil resources and such surveying will be conducted in the future as part of the overall spent shale pile design.

As noted previously, no data currently exists upon which to judge the soil depth and volume in the Phase I spent shale area. Specific topsoil quantities required for reclamation also cannot be determined at this time as WRSOC is continuing to conduct research in this area, and the final configuration of the top of the spent shale pile has not been designed. WRSOC will prepare a topsoil management plan for the spent shale area prior to any work in the spent shale area and when the above noted data are available. This spent shale topsoil management plan will be submitted to the DOGM by March 1988.

In addition, you will note that there are four areas listed in the previous table which have not yet been surveyed for topsoil thickness. These areas will be surveyed and topsoil isopach maps will be prepared and submitted to DOGM as follows:

38. RESPONSE (Continued)

- o Exhaust shaft area - December 1987
- o Bachelor Camp and RV Camp (i.e., the 100 acres utilized after 1985) - December 1985
- o Shale Fines Area - December 1987
- o Processing Area (i.e., retorts, hydrotreaters, etc.) - December 1985

Obviously, WRSOC will not be able to accurately predict the amount of topsoil available and therefore, topsoil thickness for the second and third increments of Phase I until all isopach maps have been prepared. However, this information will be submitted to DOGM prior to the beginning of work on increment two and increment three.

39. QUESTION

Where is Attachment 4?

(a) The response is adequate.

(b) It is necessary to define just what degree of erosion would necessitate additional protection. Also, a Divison judgment provision in this decision must be built-in.

(c) As above, a provision for Division input into this process is necessary.

RESPONSE

Another copy of Attachment 4 is included for your use.

(b) The original question did not request the degree of erosion that would necessitate additional protection. Our response to this additional question is as follows:

The development of six inch rivulets over 30% of the slopes of the stockpile will indicate the need for additional erosion control measures. DOGM will be advised of the effectiveness of all erosion control measures and will be consulted if WRSOC decides to use additional controls.

(c) As in Response (b), DOGM will be advised of the effectiveness of topsoil stockpile seeding and will be consulted if WRSOC decides to use additional controls.

40. QUESTION

Details on test plot objectives, experimental procedures used to make these determinations and a time-table as well as a commitment to keep the Division posted in accord with the Annual Reclamation Report are necessary.

RESPONSE

The scope of this question is broader than the original Question 40. Our response to the additional request is as follows:

The processed shale experimental plot will be constructed with the first processed shale provided by WRSP retorts. Retort start-up is scheduled for late 1988 and it is anticipated that the full production level will be achieved sometime in 1989. At the expected rate of production, approximately 3 months will be required to produce enough shale to complete the experimental pile. We therefore estimate that the experimental pile will be available for study by September 1989.

Experimental objectives for the test plot are numerous and include the general areas of vegetation, hydrology, and physical properties of the shale. These general categories are all interrelated.

In regard to vegetation studies on the test plot, the main objectives will be to determine: 1) which native species are best suited to growth and establishment on processed shale; 2) topsoil requirements for plant establishment; and 3) the most efficient means of water harvesting and the effect of water harvesting.

The main objectives of hydrologic studies will be to determine rates of percolation through the pile, the composition of leachate, runoff rates from unscaled shale surfaces and evaporation rates. A lysimeter will be constructed within the test plot to support some of these studies.

During construction of the experimental pile, various studies will be conducted to determine composition as a result of different compaction methods, effect of particle breakdown under compaction, cohesion factor, shearing plane, and so on. Some of these studies will be conducted in a laboratory as soon as processed shale is available, and the results will be used in determining construction procedures.

Experimental design to support the above research objectives will be prepared starting in 1987 and submitted to DOGM by December 1987. It should be noted that research

40. RESPONSE (Continued)

on processed shale revegetation is already in progress at Anvil Points, Colorado, and should also be available to WRSOC from the Union project currently being constructed in Colorado. The results from current studies will be important initially in guiding the research on the WRSP experimental pile, but cannot be applied directly to WRSP revegetation plans due to differences in raw shale, retorting process, and scale of the experiment.

ATTACHMENT A

Estimated Cut and Fill for Interim Approval Areas

Construction Activity	Cut Material cu. yd.	Fill Required cu. yd.	Cut Less Fill cu. yd.
Mine Access Road	60,000	10,000	50,000
Other Mine Roads	16,500	48,900	-32,400
Service Shaft Pad (includes ventilation shaft and mine administration building)	11,800	59,400	-47,600
Mine Services Building (includes storage warehouse area)	160,000	20,000	140,000
Construction Topsoil Stockpile	14,000	-0-	14,000
Decline Portal Pad and Access Road	1,000	2,200	-1,200
TOTAL	263,300	140,500	122,800